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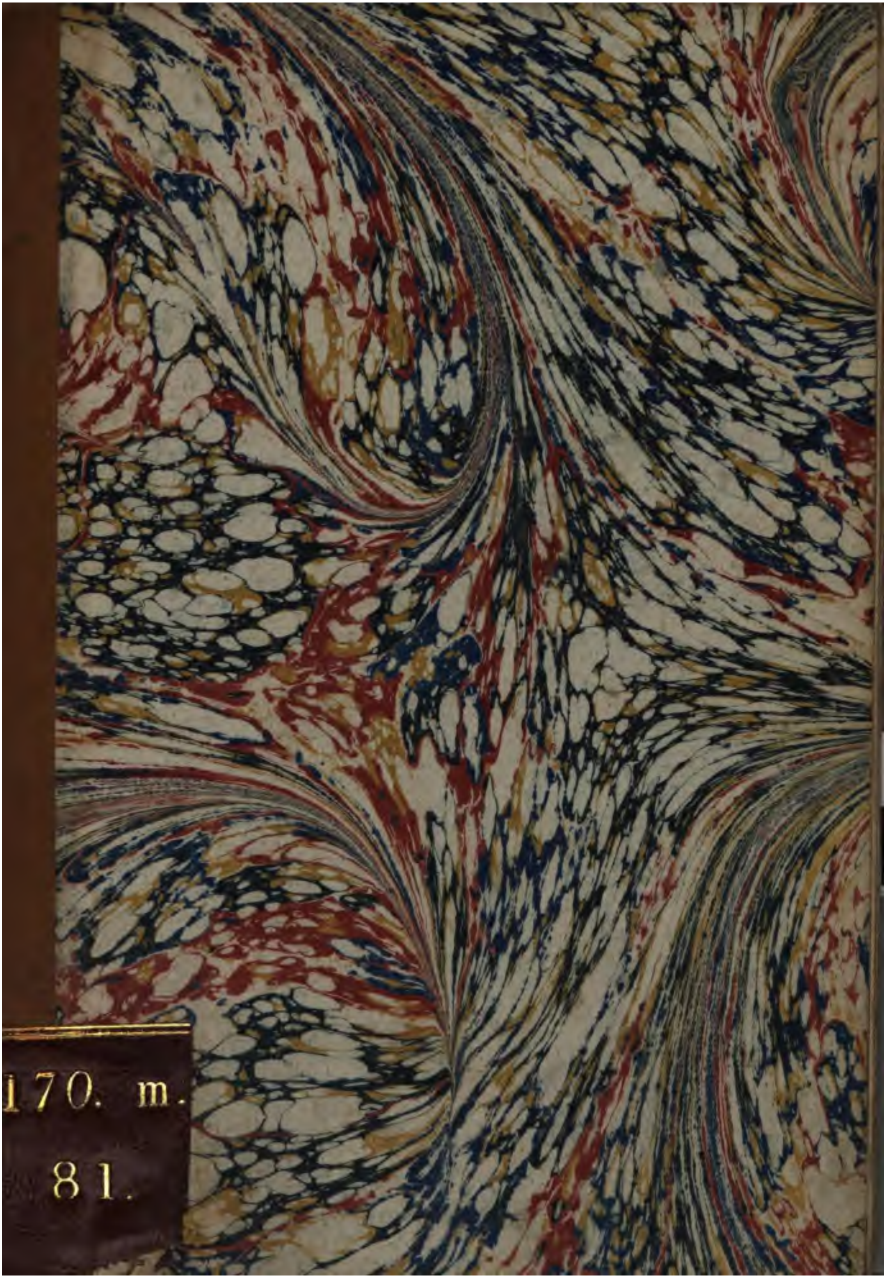

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THE

PROJECTION OF SHADOWS:

Being a Sequel

TO THE

MANUAL OF PERSPECTIVE,

BY THE SAME AUTHOR,

C. H. WEIGALL,

OF THE QUEEN'S AND CITY COLLEGES; MEMBER OF THE
NEW SOCIETY OF PAINTERS IN WATER COLOURS.

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PREFACE.

THE success that has attended the little works I have written to aid the Tyro in Art, has induced me to add this—On the Projection of Shadows—to the Manual of Perspective, to which it is properly a sequel.

In these pages I do not pretend to advance any new theory, but have availed myself largely of the labours of early writers on the subject of which I treat—particularly the Jesuits' Perspective, from which I have made copious extracts.

The difficulties experienced by beginners in reading these works, owing to their elaborate character and the quaint style in which they are written, dishearten students in the outset; they finding it difficult to wade through the complicated processes by which simple results are to be obtained.

As in the Manual of Perspective, I have endeavoured in this work to divest the subject as much as possible of technicalities, and to extract, condense, and render in easy and familiar language, the valuable labours of these early pioneers in the Field of Art.

Art education is now considered of so much importance, and any information on the subject is so eagerly sought for, that the teacher may fairly feel himself warranted in putting together and disseminating such material as he may consider useful in simplifying and elucidating the principles of the subject he may be engaged in teaching.

The numerous hand-books on Art, containing the best thoughts of experienced Professors, in the cheapest and most condensed form, offer facilities in the present day which have not until now existed. The avidity with which these works are sought, is at once an evidence of their utility, and of the growing desire to attain knowledge in this useful and elegant branch of education. In the hope that this little work may be found to be an useful addition to the existing stock, the Author commits it to the public.

13, MICHAEL'S PLACE, BROMPTON,

December, 1855.

LIGHT AND SHADOW.

◆

SHADOW is a diminution of Light, occasioned by an opaque body, which receiving and intercepting the rays of light that would otherwise be cast on the plane on which it stood, gives instead a shadow of its own form. If the luminary be larger than the body illumined, the shadow will be less than the object occasioning it. If it be equal to the body, the shadow will also be equal; and if the luminary be less than the body, the shadow will be larger, and increase in size the farther it extends; we may, therefore, draw this conclusion, that the same object may give different shadows according to the size of the luminary, though still receiving the light on the same side.

The sun being so much larger than the earth, it would appear, according to this rule, that the shadows of objects upon the earth would be less than the bodies occasioning them; and this would be true were there any conceivable relation of magnitude between the illumined body and the illuminer; but as all objects on the earth are so small in comparison to the sun, the diminution of their shadows is imperceptible to the eye, which sees them of equal breadth to the body that forms them; on this account, all the shadows caused by the sun are represented as made in parallels.

A candle or torch gives out its light in rays, proceeding and expanding from a centre, therefore the shadow increases in size in proportion to its extension; the shadow of an object is always darker than the shaded side of the object itself; supposing the object and the plane on which it is standing are the same colour or equal in tone, because the side of the object from which the light is excluded receives some light from the reflection of the brightness by which it is surrounded, and although the light so received may be given back in reflection, it is so feeble as not to materially interfere with the exclusion of the light from that portion of the plane upon which the figure or object is placed.

In defining the forms of shadows, two points are to be made use of. The first, the foot of the light, which is always taken on the plane; the second, the luminary itself. This rule is applied in common to the sun or torch, with this difference, that the rays from the sun are projected in parallels, and the rays from a torch proceed, as already noticed, from a centre. We will commence our definitions from the latter as the more simple.

PLATE I.

SHADOW FROM A TORCH.

SUPPOSE then, for example, it is desired to represent the shadow of the cube A, here represented in B, lines must be drawn from O, the foot of the luminary, through all the angles of the plan of the cube as here, O *d*, O *e*, O *f*, O *g*; then other lines are to be drawn from the centre of the light of the torch, C, through all the raised angles, until they intersect the lines from the point, O; thus, having drawn a line from O, through the angle of the plan at *d*, another must be drawn from the torch, C, through the raised angle intersecting the former in *h*, which point, *h*, will determine the shadow of that angle: and if from the same point, C, the same be done through all the raised angles, the lines of the plan will be cut in *h i k l*, these points being connected together by right lines, we shall have the shadow of the cube as hereby shown in Plate I, and more distinctly in Plate II, in which the shadow is given without the lines of construction.

Plate I.

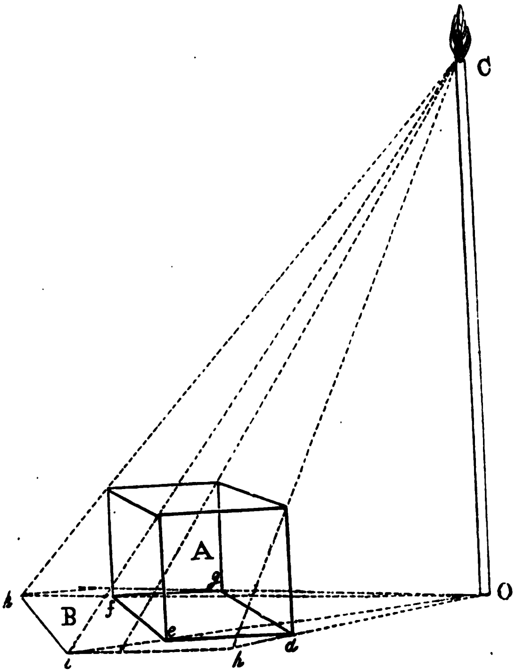


Plate II.

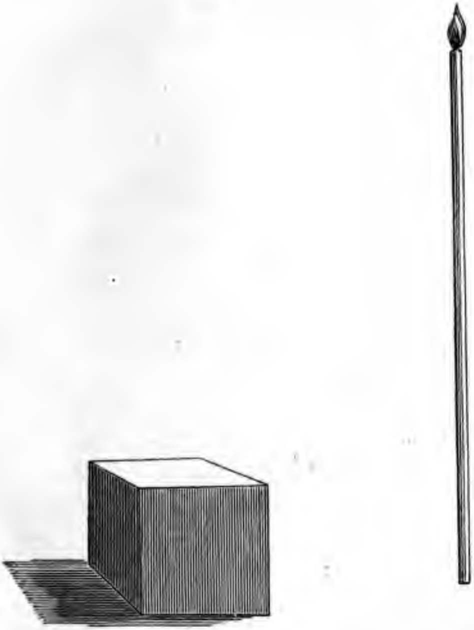
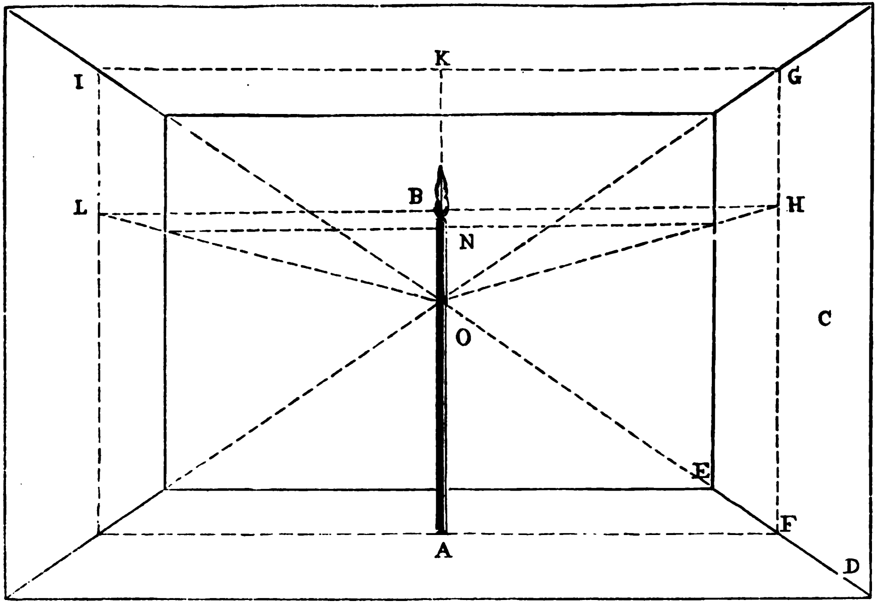


PLATE III.

It has been already observed that the rays of light proceeding from a torch, differ from those of the sun, inasmuch as they proceed or radiate from a centre, while those from the sun are projected in parallels. The sun being above the horizon when we perceive its light, the shadows from the objects illumined by it must necessarily be projected on the plane below it; but the case is different with torch or candlelight, which may be placed above, below, or on the sides of objects, and will, consequently, yield shadows in any direction. To find the foot of such luminary in a room, we must consider all its parts, as the floor, the ceiling, the sides, &c., as having points whereon the foot of the light may be placed; and that from these points lines may be drawn through all the angles of the plan of the object whose shadow is required. The intention in this plate is to show how such foot may be found. The torch being placed in A, the middle of the room, this point is the foot of the light, B, by which the shadows of objects on the floor are to be governed. To find the foot of the light on the wall, C, draw a parallel to the base line from the point, A, until it meets the ray D E in the point F, from which erect a perpendicular, F G; then from the point, B, which is the light, draw another parallel with the base line, until it reaches F G in the point H, which point will be the foot of the luminary to find the shadows

Pltae III.



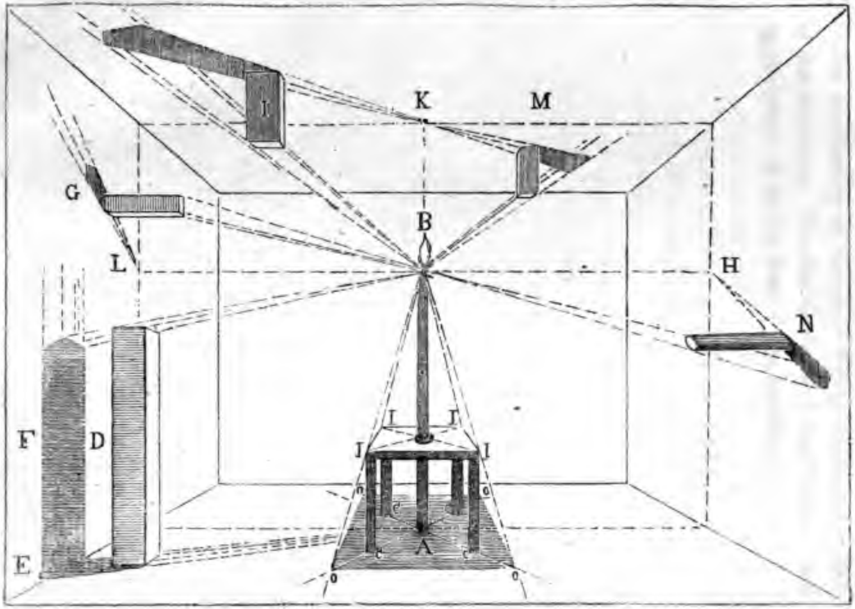
on that plane or wall of the room. To find the foot of the same luminary on the ceiling; from the point, G, draw a parallel to the base line as G I, and from the point, B, erect a perpendicular to it, which will give this point as the foot of the luminary, by which the shadows on the ceiling are found. To find the shadows on the opposite side or wall of the room, the same method must be observed as for the side, C, and you will have the point, L.

PLATE IV.

THE preceding illustrations being understood, will help to find the shadows of objects disposed on all sides of the room, for having found the foot of the luminary as already directed, the apparent difficulty will be removed, the method throughout being the same with that in the preceding examples; thus, to find the shadow of the table on which the torch is placed, lines must be drawn from the foot of the torch A through all the feet of the table, C; then from the point of the light, B, draw lines over all the angles of the table, I I I I, until they intersect the rays, C C, &c. in the points, I O, which will give the bounds of the shadow of the table.

The shadow of the object, D, is found by drawing lines from the foot of the light, A, through all the angles of the plan as far as the angle of the wall, D, and from that angle raising them perpendicularly. Then from the point of the light, B, drawing lines over the object, and observing the angles corresponding to the lines of the plan, you will have the shadow, F, of the object, D. The shadows of all the other objects are found after the same manner, so that all we shall have to note, is the foot of the luminary, to be found on the floor, the ceiling, and the sides of the room as directed in plate. The light itself being supposed in point B.

Plate IV.



Thus, to find the shadow of figure, G, the point, L, is the foot of the luminary.

For the shadow of figure, N, the point, H, is the foot of the luminary. For the shadows of the figures, I and M, the point, K, is the foot of the luminary.

PLATE V.

TO FIND THE SHADOW OF A CROSS BY TORCH LIGHT.

THE preceding illustrations being understood, there will be little difficulty experienced, although at first sight it may appear complicated. The place of the light and the foot of the light being obtained, lines drawn from the foot of the light, through the angles of the plan, being intersected by lines drawn through the raised angles from the luminary, their points of intersection will determine the form of the shadow.

Plate V

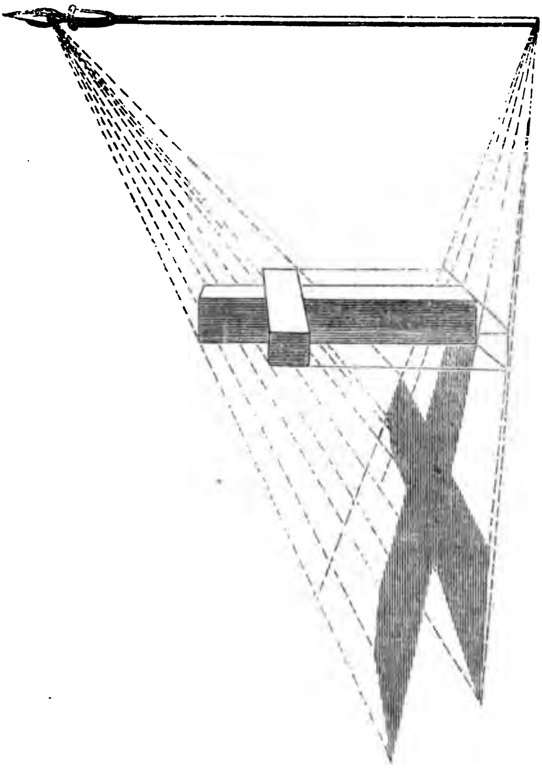


PLATE VI.

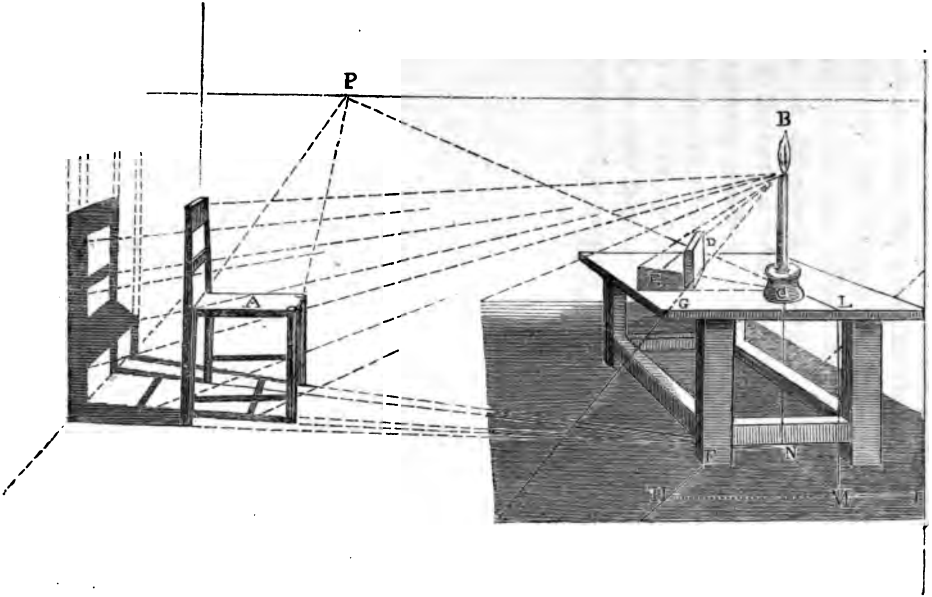
SHADOWS ON SEVERAL PARALLEL PLANES.

THE first plane is the floor upon which the chair, A, stands; the second plane is the upper part of the table parallel to the first, and above it, D, is an object placed upon the table.

Suppose the foot of the luminary to be C, and the luminary itself to be B, from these points, C B, draw lines through the upper and lower angles of the object, D, and their points of intersection will give the shadow, E, upon the table.

To find the shadow of the chair, A, which is placed on the floor. Find the place on the floor of the foot of the luminary, under the point C, the foot of the luminary on the table. This is to be done in the following manner: from the point of distance or vanishing point on the right, which is here supposed beyond the limits of the paper, draw a line through the foot of the table, F, then from the angle, G, of the table, let fall a perpendicular, cutting the line, F, in the point, H; and from H draw a parallel to the base, H I, which is equal to the upper part of the table, and directs us to the point required. For drawing a line from the point of sight, P, through the foot of the luminary, C, to the extremity of the table at L, from this point let fall a perpendicular to H I, which will give the point, M, then from M draw a line to the point of sight, P, in which line, M P, will the foot of the luminary be found on

Plate VI.



the floor. To determine the precise point, let fall a perpendicular from the point, C, which cutting the line, M P, will give the point, N, for the foot of the luminary on the floor. This point ascertained, there will be no difficulty in finding the shadow of the chair, A, the method being the same, as for the other objects already described, that is, from the foot of the luminary, N, draw lines through all the angles of the plan of the chair, and other lines through the upper part of the chair from the light, B, and their points of intersection will express the bounds of the shadow.

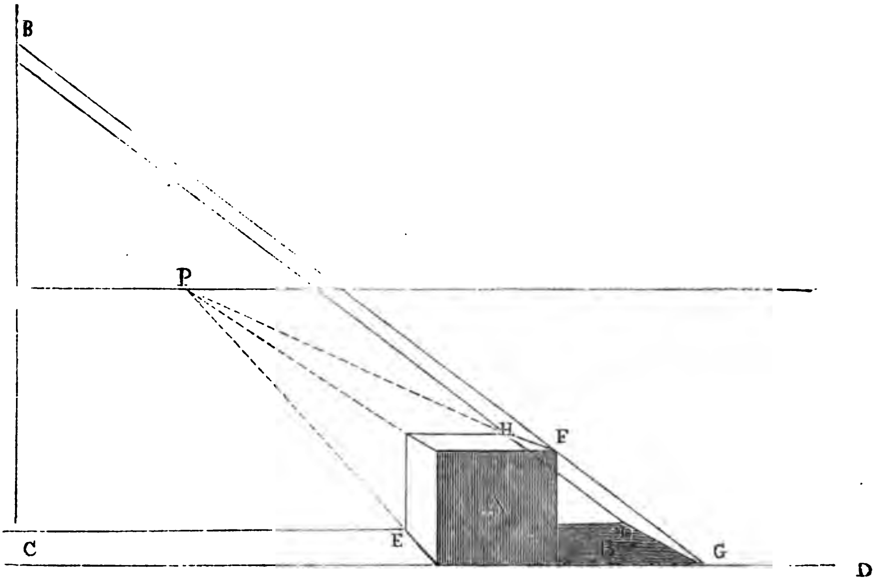
SHADOWS FROM THE SUN.

It has been already observed that when the light is larger than the body illumined by it, the shadows projected would be smaller, and diminish in proportion as they receded; but the sun being so much larger than the earth itself, and the objects that come under the artist's notice bearing no conceivable relation in magnitude to it, the diminution of their shadows is imperceptible to the eye, which sees them always of equal breadth to the bodies by which they are projected; on this account, all the shadows caused by the sun are represented in parallels. To find the shadow then of any body opposed to the sun, a line must be drawn from it, perpendicular to the plane where the foot of the light is to be taken, and from this point a line drawn through one of the angles of the plan of the object, and another drawn from the sun through the raised angles, the intersection will show how far the shadow is to extend. Example,

PLATE VII.

To find the shadow of the cube, A, the sun being in B, from the bottom of the sun at C, which is the foot of the light, draw a line through one of the angles of the plan, as C D, then from the other angle, E, draw a parallel to it; the breadth of the shadow being thus obtained. To find its extremity, draw a line from the sun through the raised angle, F, cutting the line C D at

Plate VII

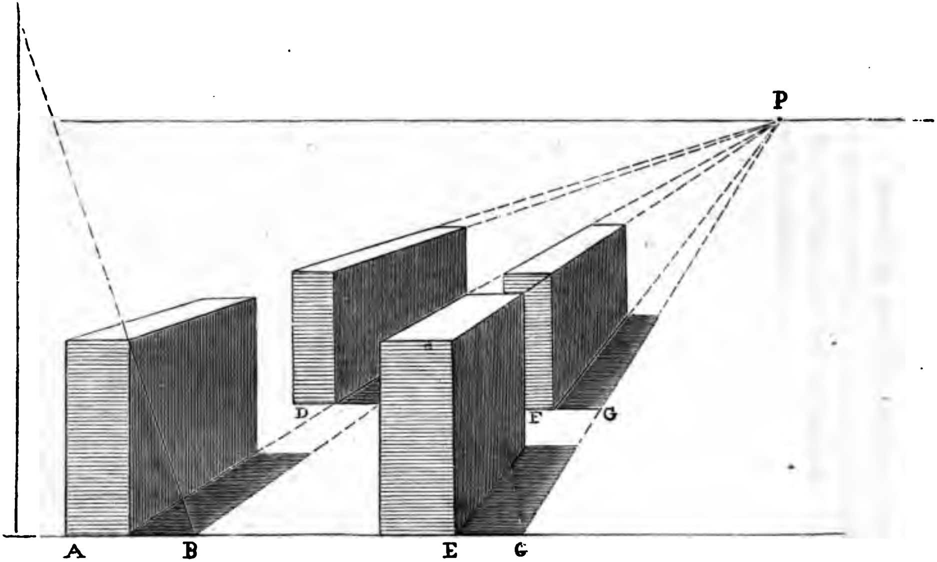


G, then drawing a parallel to this line through the angle, H, it will cut the line E in the point I, these two lines being connected by a line drawn to the point of sight, completes the shadow of the cube, G I; the shadows will vary according to the position of the sun in the horizon, and are perspectively governed by the same vanishing point as the object that projects them.

PLATE VIII.

The shadows produced by the sun are equal in all objects of the same height, although at a distance from each other, subject to the same perspective law that governs the object projecting them. Experience teaches us that elevations of the same height, however widely they may be removed from each other, are still of the same height, although they appear perspectively different; and that the shadows projected by them, although equal in all, are still subject to the same difference; the shadows of course will vary in length according to the position of the sun in the horizon, lengthening and shortening in proportion as the sun comes nearer or recedes farther from them. For this reason, when the shadow of an object is to be produced, we must determine the sun's place and the point underneath, which we call the foot of the luminary, and then draw two lines as before directed, one from the foot of the light through the lower angle of the object, and one from the sun through the upper angle. To define the extremity of the shadow, as in the plate, the wall, A, gives the extreme of its shadow in B, and if from this point, B, a line is drawn to the point of sight, P, the line, B P, will be the shadow of the wall, D, as well as that of A, and of all others of equal height in the same line to the point of sight; in effect it must be held as a *certain* maxim that shadows always retain the same

Plate VIII.



vanishing points as the objects that project them. Therefore, if it is desired to give the shadows of the walls, E F, which are the same height as A D, you have but to repeat the process observed in the walls, A D, and the result will be found as E G, F G.

PLATE XI.

If the position of the sun bring the light nearer to the foreground, as is represented in this plate, the method to be pursued is the same as in the last plate, but only the foot of the light is to be brought nearer or farther off according to the sun's place and lines drawn, as in the last example, from the centre and foot of the luminary through the upper and lower angles.

Thus, the foot of the light being placed at H, and a line drawn from thence through the angle, K, and another line from the sun through the raised angle, will give the extreme of the shadow of the wall, K, in the point, L; and from L a line drawn to the point of sight, P, limits the side shadow; and from the remote angles of the plan of the wall, a parallel to the line, H, drawn as far as the ray, L P, will give the extreme end of the shadow.

Plate **IX.**

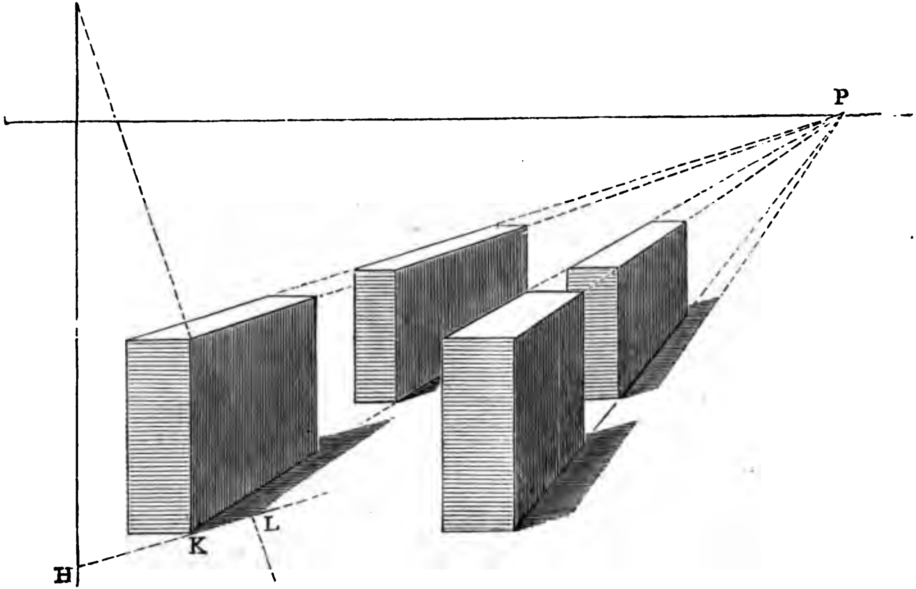


PLATE X.

When the sun is before the eye, that is, directly over the point of sight, the sides of the shadow it produces will be parallels, as all the visual rays are, for this reason, the point of sight is always to serve for the foot of the light when in that position; and the other ray that is to determine the shadow, will be taken from the centre of the sun; thus the shadow of the cube, A, being required, draw lines through the angles of its plan, B C, to the point of sight, P, as the lines B E, C F; then from the centre of the sun, G, draw two rays through the raised angles of the cube, intersecting the lines B E and E F in the points K and L; these points being united by a right line, the shadow of the cube will be found in B K, L C; the shadow of the other objects, M and N, are found by the same rule, and so of any other objects on the same plane under the same circumstance of light.

Plate X.

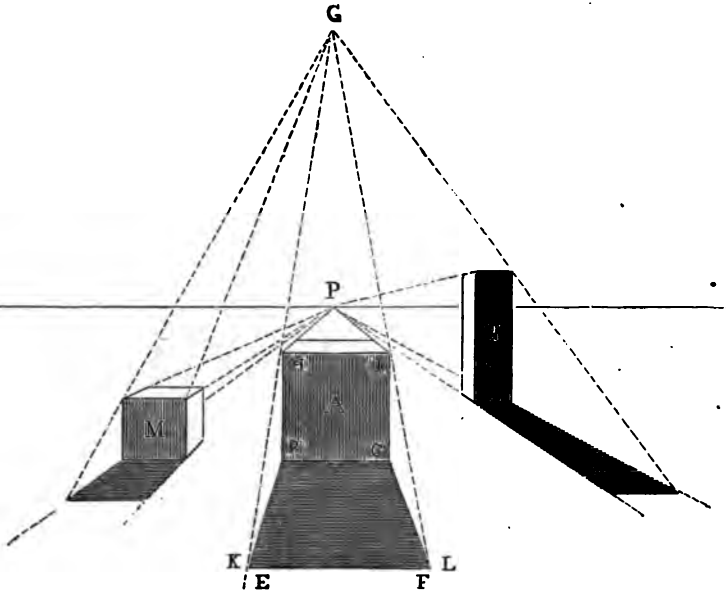


PLATE XI.

PERFORATED OBJECTS.

When the object is square or rectilinear, a line must be drawn from the foot of the luminary, A, through the angles of the plan for one side of the shadow, A D; and parallels thereto, for the other side; then from the sun, B, draw a line through the raised angle, C, which will cut the line from A, in the point D, from which point a line must be drawn to the point of sight, P, until it meets the remotest line in the plan, F. To find the rest of the shadow, draw parallels to the lines B C D, through the angles G H I C, and inasmuch as the sun illuminates two sides of the object and makes the shadow broader, as is shown in the figure, where H I and G C are the diagonals of the square pieces, where these lines drawn through G C and H I cut the line A D; lines drawn to the point of sight will give the shadow of the object complete.

Plate **XI.**

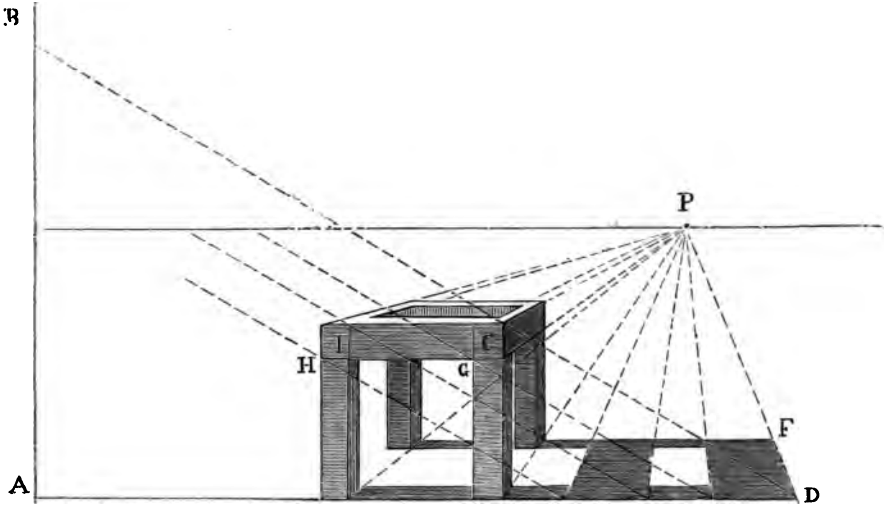
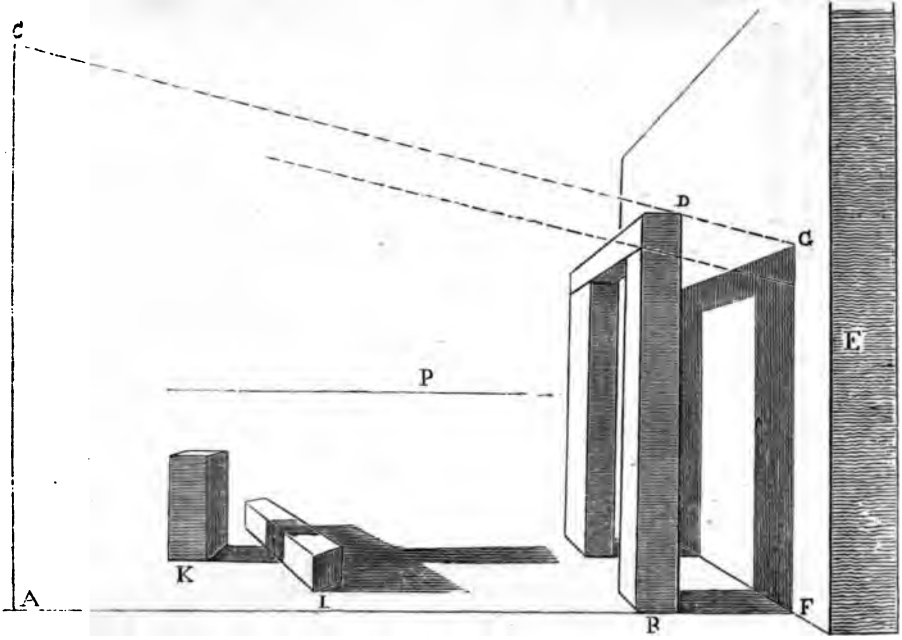


PLATE XII.

HITHERTO we have considered shadows occasioned by the sun on a horizontal plane, and if the directions given have been well understood, there will be no difficulty met with in this diagram. The rule being the same, and a little instruction will suffice to show how shadows rise and sink according to the planes on which they are cast.

To show that these shadows are formed by the same rules as those preceding, draw a line from the foot of the luminary, A, through the plan of the door, B, and another from the sun, C, over the top of the same doorway at D, these lines would intersect each other, though without the limits of the drawing, and give the extremity of the shadow as already explained of others on the horizontal plane; but the wall E preventing the line A B from being continued, as it should be, if the plane were horizontal, causes it to rise as we see in F G, so the sun's rays, which should proceed to meet the line, B, cuts it on the wall in the point G, and there marks the form or shadow of the doorway, the receding angles of which, as well as those of the shadow, converge to the point of sight. The shadow of the object, K, is cast in all its length, and passes over the other object, L; and it must be observed that the shadow still preserves its length, although it meets

Plate XII.



with a raised object in the way; and that the shadow which passes over an object in its course is modified by the form of that over which it passes, as here the shadow from K passing over L, gives the form of that object until merged in its shadow.

PLATE XIII.

SHADOW FROM A FIGURE.

To find the shadow of a figure clothed, draw a line from under the feet, S, to the point of sight as here the line, S P, and through the bottom of the dress draw two parallels to the base line, as T and V, and between the two, another line, X, for the middle of the figure; then from the top of the head draw a line for the ray of the sun, to be continued until it intersects the line X in the point Z, which point will be the extremity of the shadow; the rest of the shadow will be drawn between the two parallels, T and V; if any folds or projections occur in the figure, they must be drawn by parallels to Y and Z till they cut the line V, thus 1 gives the shadow of the projecting elbow, and 2 that of the gown. The foot of the light is understood here to be the same as in Plates XI. and XII.

Plate XIII.

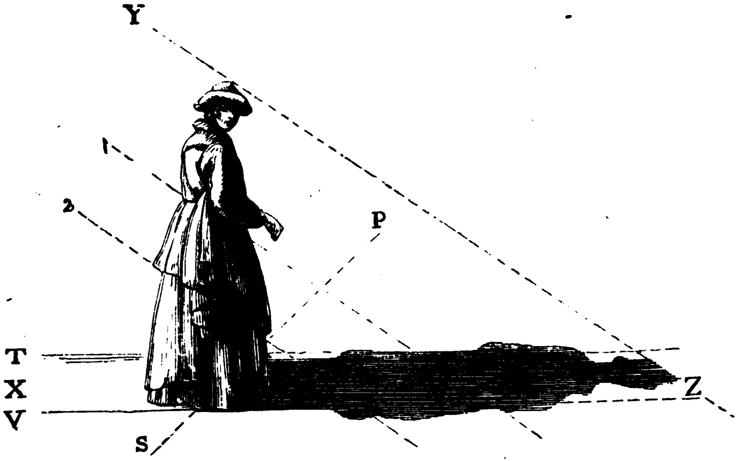
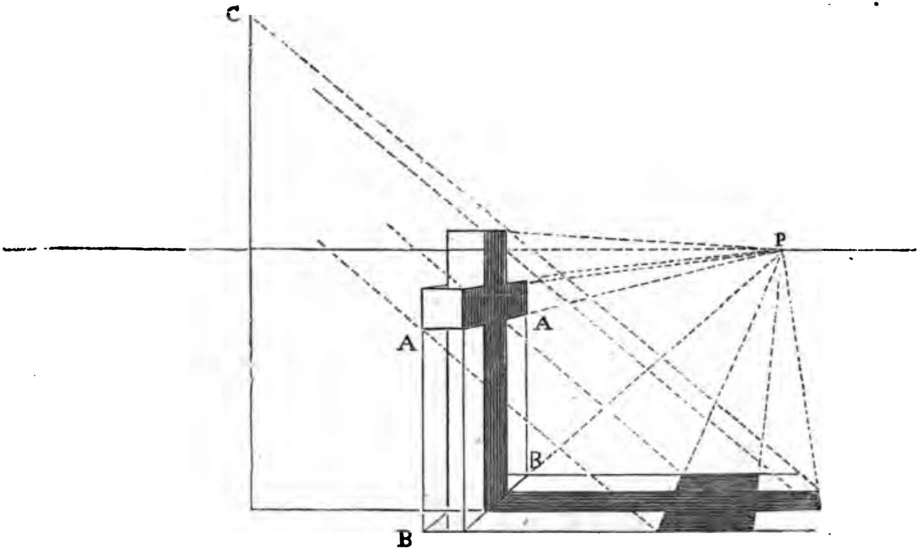


PLATE XIV.

When the shadow of an object is required, which shall have parts wider than the base, as in the example of a cross, the usual method is to make a plan and draw perpendiculars from it, 'as B A, B A, a line must then be drawn underneath the sun as already mentioned, and parallels to this drawn from all the angles of the plan, then a line is to be drawn from the sun, C, through one of the raised angles of the object, until it meets the line of the plan of the same angle at E; another line is to be drawn over the angle, A, until it intersects the line B A in the point F, then drawing lines from these points to the point of sight, the shadow of the object will be completed.

Plate **XIV.**



What has been said in the preceding pages, refers wholly to the linear laws governing the placing and amount of space occupied by shadows, and thus their forms. There are other considerations with respect to their intensity; whether arising from the position of their various planes, or from certain qualifications of reflection, or from aërial perspective, as affected by different distances or different amounts or densities of atmosphere; of such contingencies, a few general remarks is all that in a rudimentary work like the present can be given.

Let it first be understood then that a ray of light of any sort, whether from the sun or torch, will illuminate that portion of an object most brightly, where such portion or plane of the object shall present a right angle to the ray, and in proportion to the declination of such plane from a right angle, will it be less brightly lighted. If, for instance, an octangular tower were so placed as to receive the light directly upon or at right angles to one of its sides, the two adjoining sides on either hand would be also in light though less bright than the centre; the two next occurring sides of the octagon would thus be *just* and only just deprived of light because they would be so placed as to be parallel to the ray. Were there, however, any inequalities of surface on either of these two sides, such inequalities, however slight, would be strongly expressed in light and shadow, according to their positions with respect to the light. Of such inequalities, let us suppose now that the direction of the light were not immediately at right angles to one of the sides of the octangular tower, but approximating to it, in such case the side which was most nearly to, or at right angles with, the light, would still be the side most brilliantly lighted; but the next succeeding sides would not now be *equally* lighted, though both would be still in light; that one of the two being least light, though but slightly so, which was most turned from the direction of the light, although still in light—in this case a fourth side—one of the two before noticed as just in shadow, would receive some portion of light, though less than the first three; the other four faces would be necessarily in shadow, but not equally so, the difference arising out of the circumstances of reflection.

That which applies as to direction of light upon the vertical or upright faces of the octangular tower, applies equally to surfaces turned in other directions, as for instance, the sides of a cube.

Reflection will readily be understood to be the secondary or returning light thrown by an illuminated portion back upon the shadow side of an object, the cast shadow of such object will then be more intense than the shaded side of the object by which it is cast; inasmuch as the parts still in light immediately surrounding the cast shadow, will throw a diffused light back again upon the object; this is termed reflected light, and it must be borne in mind that such reflected light can never amount to the same brightness as any portion of the object receiving the real light.

With the colour of such reflected light we have nothing here to do, though it forms an important consideration in the construction of a picture; we here confine ourselves simply to light and shade as produced in a drawing by mere black and white.

We will now take the two circumstances together in the description of the light and shadow upon a sphere or ball.

A white plaster of Paris ball is to be purchased at most plaster-cast shops, and will be found most useful in explanation of what is now to be said:

The part of the ball most lighted will be a mere speck of white, being the small portion of its surface which presents itself to the direction of the ray, the parts insensibly curving away from that spot, will be necessarily less light, as their curvature in every direction carries their surface farther out of the rectangular direction of the light until they merge into shadow; and here will be the darkest spot, because now comes immediately into action the returning or reflecting light, the brightest part of which will be that portion most remote from the high light on the lighted side. The effect which other chance objects placed near the side which is in shadow, will affect the circumstances of reflection in so many ways that it would be impossible to define them; suffice it then to observe, that the same general rule applies, and the contingencies will supply their own reasons in the application. It must not, however, be forgotten that the diffused light from the sky will more or less affect the whole upper surface according to circumstances.

We now come to the third consideration — the power or depth of shadows more or less as affected by distance or atmosphere.

Now with respect to cast shadows, they will be for the most part found to be darkest near the objects which cast them, diffused light being most powerful in its effect upon the most remote parts of the shadow. It may be taken as a general rule that shadows, as well as objects, become by distance less dark, not absolutely because they are more distant, but because such distance supposes a greater amount of interposed atmosphere between them and the observer ; and according to the density or opacity of such atmosphere will they be more or less affected. The same circumstances and the same reasons will account for the lesser degree of darkness in distant than near shadows. This is, however, to be taken as a very general rule, for the accidents of reflection are such, and so many, that it were vain to endeavour to explain them by words alone. Nature will suggest in practice the course to be adopted.

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